COST *and* MANAGEMENT

THE OFFICIAL JOURNAL OF

THE CANADIAN SOCIETY OF
COST ACCOUNTANTS & INDUSTRIAL ENGINEERS

INCORPORATED 1920
HEADQUARTERS, 301 MACKAY BUILDING,
66 KING STREET EAST, HAMILTON
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Vol. XIII AUGUST No. 8

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Subscription price to non-members, $5 a year. Single copies 50 cents. Members desiring 5 copies or more of a single issue may obtain them at 25 cents each.

★ EDITORIAL ★

The Business Trend

According to reports, the general trend of business, so far as Canada is concerned, continues to appear favourable. More confidence is apparent, and those supposedly in the know are firmly of the opinion that the trend is definitely upward. Of course, the reversal of the previous downward trend in the United States has a lot to do with the situation in Canada, but there are other reasons, chief of which are the improvement of the crop situation in Western Canada, and the prospects for good wheat and tobacco crops in Ontario. Whatever the reasons, however, the fact remains that there is a very different feeling evident than was the case a month or two ago, both here and in the U. S. A. On a recent trip to California, the writer had the opportunity to observe at first hand the different atmosphere south of the border. Not once, outside the State of Michigan, did one hear the words depression or recession. In fact, people generally were very optimistic, especially in the Western States and Texas, where crop conditions are really excellent. Moreover, there is a definite feeling that business and President Roosevelt have at last got together, something which almost everyone believes will be for the ultimate good of the country. The signs for a revival of business are distinctly favourable and it is to be sincerely hoped that they remain so.

The Wheat Crop

With an estimated wheat crop of 300 million bushels, compared to some 160 million last year, prospects in Western Canada at the moment are extremely bright. The price for this wheat crop has been pegged by the Wheat Board at 80 cent per bushal, and, allowing for the usual deductions for handling, freight and discounts, the net return to the farmer should be around 60 cents. With deliveries approximating 200 million bushels against 125 million when the price was around $1, the increase to the farmers should be about $25,000,000. While this increase may not look large, there are other factors to consider. Barley and oat crops are expected to be larger than last year, also the hay crop, and with a greater production of cattle, hogs, sheep and poultry, according to the experts. All these things mean increased business to the railways, grain companies, banks and stores, which should result in a decrease in unemployment, thus providing more purchasing power for both farm products and other commodities. All this depends, of course, on the

estimated wheat crop being harvested, but there is every reason to believe that it will. Western Canada has suffered several lean years, but with the probable end of the drought cycle and a good crop this year, confidence will return, and genuine confidence spreads very rapidly, especially when it is accompanied by a decided increase in purchasing power.

The Automobile Trade

One industry that has suffered severely as a result of the present slump in business conditions is the automobile trade. In Detroit, people are definitely pessimistic concerning the immediate future, and this city, the centre of the automobile trade, has suffered severely from the recession. There is, however, a different side to the picture, according to the Brookmire Forecaster, for actually the outlook is as favourable as the present figures appear unfavourable.

The industry has rarely been closer to a shutdown at this season of the year, but, as the trend of the cycle turns upward, the sequence to be expected in the motor industry, according to the Brookmire Economic Service is that:

1. Retail sales of autos will mount more than people's incomes, especially as confidence returns;

2. Production of autos will have to be stepped up more than retail sales in order to re-stock dealers;

3. Purchases of materials and parts will have to be increased more than production in order to rebuild manufacturers' depleted inventories.

The forces, of course, work back to the various industries supplementary to the motor industry, and any revival in the motor industry is naturally immediately felt in the steel, glass, copper, rubber and various other industries which supply materials and parts to the motor industry.

Moreover, the benefits of extensive new model preparations by the industry will be felt in the immediate future, which, the Brookmire Forecaster points out will be a time when the movement of crops also exerts a spurt.

AT HEADQUARTERS

Vacations over for most of us, our thoughts now turn to our Fall and Winter plans.

Right now, we are engaged in the task of preparing programs for four Chapters, and, if present plans materialize, the programs will be the best ever. Care is being taken to ensure that interesting speakers are invited, with subjects to be discussed that are both informative and varied.

It is expected that Hamilton, Toronto, Kitchener and Niagara Peninsula Chapters wlil combine in one big meeting at Hamilton for the opening

of the season, with a large delegation from the Buffalo Chapter of the National Association of Cost Accountants present on this occasion also.

If this meeting is arranged, it should be a banner occasion, and present indications point to arrangements being completed.

That there will be several new Chapters organized during the coming season goes without saying. Prospects are bright in Windsor, while Ottawa and Qubec city may be organized.

In the West, prospects are extremely bright. Fort William-Port Arthur is ready for a Chapter, so is Winnipeg and Vancouver, while further preliminary work in both Edmonton and Calgary may result in new Chapters in those cities, and, if all this can be accomplished, the Society should be on a far sounder basis than ever before in its history.

We should not lose sight, however, of the need for the strengthening of all Chapters by the addition of new members. Several have been secured since the Annual Meeting, and their names appear elsewhere in this issue, but there should be no let-up in this effort, and all members can and are asked to help in this campaign for new members. It is hard to interest prospective members during the heat of the summer, but any member contacting a prospect should immediately forward his name to the Secretary Manager or his Chapter Secretary.

Hamilton Chapter won the trophy awarded for the greatest percentage of increase in membership last year and has already made a good start to repeat, but the competition promises to be very keen, with three new Chapters all ready and anxious for the fray this year, and each member is urged to take a keen interest in this competition.

Activities have naturally been pretty much at a standstill during the hot summer months, but all members should be prepared to take an active part in a real program, commencing this fall.

This should be a banner year for new student members, and we are hopeful that sufficient new student members can be secured to ensure the formation of student sections in many of the Chapters.

This student membership is a very attractive proposition to htose studying a bona fide course, and if any member is not familiar with the details of student membership and is interested in securing new members of this type, a post card to head office requesting this information will obtain it quickly.

The Society is better known than at any time in the past, and we believe favourably known, but there must be no let-up in our efforts to build on a secure foundation. We cannot for one moment relax our efforts, and this applies to every member.

Our Society should have its best year to date. The business trend is definitely upward and, moreover, our activities are increasing rapidly.

May we also draw to the attention of members the fact that we have at head office a Reference Library, containing some fifteen hundred articles on innumerable accounting, cost accounting and business management subjects.

These articles are available on loan to members on request, and you are urged to take advantage of this service.

Reference Literature Received

Accounting for Standard Costs.

The Cost Accountant. June.

A good description of a system of accounting procedure for the use of standard costs in industry, by Charles H. Durman, F.C.W.A.

The Sources of Cost Information.

The Cost Accountant. June.

A timely article, by J. A. McMillan, F.C.W.A., on a subject of general interest to all Cost Accountants.

Costing in the Tin Box Making Industry.

The Cost Accountant. June.

A short but informative article on Cost Accounting in a particular industry, by W. G. Kemp, A.C.W.A.

The Vermont Maple Furniture Company.

N. A. C. A. July 1.

A case study in connection with the furniture industry. A well written and complete article which should be of value to all Cost Accountants, and especially to those engaged in this industry.

Inventory Control Under Fluctuating Production.

N. A. C. A. July 15.

Inventory Reserve Plans.

N. A. C. A. July 15.

Both these articles are by Professor W. P. Fiske of the Massachusetts Institute of Technology, and form a valuable addition to much that has been written on similar subjects. These articles are related and should be read by all those interested in a very complex and yet a very important subject.

Costing in the Coca and Chocolate Industry.

The Cost Accountant. July.

A case study of a Cost Accounting System devised for this particular type of industry, but of interest to all those interested in the science of cost accounting.

Outline of Cost Procedure in Paint Manufacture.

N. A. C. A. June 15.

A case study of Cost Accounting for the Paint Industry, by Will Doll, and represents a most valuable contribution to cost literature designed for this particular industry.

Cost Figuring in the Paint, Varnish and Lacquer Industry.

N. A. C. A. June 15.

This article, by W. R. Sieplein, while dealing primarily with costs in the designated industry, is more general in its application, presenting as it does methods which can be used by othe companies in similar industries.

Brewery Accounts.

The Canadian Chartered Accountant. August.

By W. L. Lucas, C.A., of Edmonton, Alta., and is a clear and complete article on Accounting procedure for a Brewery.

A Mechanised System of Sales Accounting for Breweries.

The Accountant. June 18.

By G. S. Hamilton, A.C.A., and is the description of a mechanised system in actual operation in the Brewing Industry.

The Cost Principle in Minimum Price Regulation.

Michigan Business Studies.

By Herbert F. Taggart, Professor of Accounting, University of Michigan. Observers of the progress of regulation of competitive trade, especially in the United States, have noted with mixed feelings the increasing demand for the passage of laws forbidding sales below cost.

The many difficulties inherent in attempts to force such legislation are well recognized, but Professor Taggart's study points out for the first time in detail the technical difficulties of defining cost for such a purpose. There is general agreement that these difficulties do exist, but there has not previously been a thorough-going effort to analyze them in terms of an item-by-item consideration of cost elements and their application.

While primarily an analysis of a current issue of far-reaching implications, the volume of about 180 pages contains illuminating discussions of a number of important cost accounting problems, especially those involved in the formulation of uniform cost systems for trades and industries.

Professor Taggart, the author of this volume, spent a year as Chief of the Cost Accounting Unit, Division of Research and Planning, National Recovery Administration. This intensive experience in analyzing the multitude of cost formulae proposed under the various codes provides a unique background for his appraisal of the cost principle of price regulation. It has enabled him to enrich his discussion with a wealth of illustration drawn from specific attempts at its application and which could hardly be drawn from any other source.

While this volume will naturally be of primary interest to those engaged in work in the U. S., it is, nevertheless, a volume which ought to be read by every Cost Accountant. Professor Taggart deals with the subject in a masterly manner, and no interested person digesting this material could fail to gain very considerable gainful knowledge from such perusal. (Published by the Michigan Business Studies, University of Michigan, School of Business Administration, Bureau of Business Research, Ann Arbor, Mich.

Any or all of the above articles, together with others in our Reference Literature Library, are available on loan to members on request.

Forum Section

To The Editor,

Dear Sir,—

For some time now we have experienced difficulty in reconciling actual inventory accounts with both stock cards and stock ledgers, and also our

Work in Process Inventory has been sadly different from the Work in Process Control Account. We have tried several methods to combat this trouble, but, so far, have not been able to definitely stop the leaks. Perhaps you have some literature on file relating to this trouble, or, if not, maybe you would publish this letter in the Forum Section of "Cost and Management" and some member or members with information on this subject could notify us through you as to the methods they employ.

We can assure you that any such information would be received in the strictest confidence, and we should be greatly obliged.

We employ about 180 hands and manufacture a product necessitating the manufacture of about two hundred and fifty small parts and the assembly of these parts into one complete product.

Your very truly,

COMPANY "A. B."

On another page in this issue is an article on Inventory Control, contributed by a member and which will undoubtedly assist you in your trouble. Contributions by any member on this subject will be forwarded as received, and members with knowledge on this subject are urged to assist.—Ed.

Inventory Control

(Contributed)

In any industrial plant, one of the greatest bugbears to management is the matter of Inventory Control, and it is generally agreed that no Cost System is complete unless it embodies some measure of definite control of both stocks and work in process inventories. In a Job Cost System, supplies are issued to the plant usually in just sufficient quantities, where possible, to complete the job, and any supplies not used are to be returned to stores immediately the job is finished, and the cost credited to the particular job. It is true that, unless carefully watched, plant foremen will neglect this very simple formulae and use the supplies unused on this particular job on another and similar job, but ordinarily it is a fairly simple matter to control work in process supplies under a job cost system. Even under an operation or a process cost system, it is not very difficult to directly control work in process inventory, because each operation is listed daily, and an efficient cost man can soon tie in the number of operations on a job and the number of parts operated, with materials used, but with a Standard Cost System in vogue, unless extreme care is taken, it is often difficult to tie in the cost of materials in process with parts and materials issued and those finished. Also, on any type of cost system it is very easy for stores control to become lax and inefficient unless some method of constant checking is devised to tie in actual stocks on hand with stock cards and the stores ledgers. Such checking can become an expensive proposition but it is possible to check leaks and to enable the stores and ledger records

to tie in with the existing balances with little expense if a simple system is kept up to date. Similarly, it is possible in many plants to keep the work in process inventory fairly well in line with control records and enable costs to come out accurately both at the end of each month and at the end of the year. There is little more galling to management than to run along for a year feeling that a fair profit has been earned, only to find after the inventory has been costed, that the apparent profits have been wiped out through losses on inventory, and this often happens. Moreover, it is possible, with little expense, to keep the Purchasing Department thoroughly posted as to stocks to be replenished.

As already stated, on a Job Cost System, and to a smaller extent on a Process or Operation Cost System, the matter is not nearly so difficult, so that we will confine the study primarily to one in conjunction with a standard cost system. Standard costs are, in the last analysis, simply an accurate estimate of what costs should be, under a given set of conditions and which conditions are anticipated.

The main thing, then, is to determine accurately the variances between actual and standard costs, to eliminate the differences wherever possible and, in short, to provide management with an accurate guide as to the cost trend.

Materials are usually set up at a standard cost, the difference between actual and standard being taken care of by means of a material variance account. These materials are issued to work in process at standard and of course, when parts are completed and returned to finished parts or finished goods stores, the standard materials cost, plus standard labour cost and standard overhead cost becomes a credit to work in process and a debit to finished parts or finished goods stores, as the case may be. So far so good. Ordinarily then, if a correct record is kept of labour and overhead variances, at the end of the year the work in process cost should definitely tie in with the controlling account, but very often does not, and the net result is a decided headache, both to the cost accountant and to management. An efficient cost man will see that only those materials which are chargeable to work in process are thus charged, the tendency being to allow the work in process account to become a dumping ground for charges which do not rightfully belong there, and these, not being taken into consideration in the standard costs, stay in the W. I. P. account, and at the end of the year become a charge to Profit and Loss through the medium of an Inventory Adjustment. Assuming that labour and overhead variances are properly recorded monthly, or daily, and taken care of, the main trouble would seem to lie in materials.

Too often just a cursory check is made as to the quantity of material required to produce a certain number of parts and a standard materials cost set up on this check. The cost man should be constantly on his toes, make periodical checks in this regard and work with the engineering department so as to become immediately aware of changes in operations which may reduce or, in some cases, increase the material required for the given number of parts. Nor should any standard be set up on one check wherever it is possible to make other checks quickly.

The gross weight of material, including scrap, should be charged to production and be set up as the standard weight of material required. This properly done, the situation seems to be licked, but too often it is not. Once more we have the human element to deal with. In many instances, especially where materials or parts purchased arrive late, the storekeeper will issue such materials or parts on promise of a requisition as soon as the foreman can be found to sign such requisition, or they may be issued without requisition for a variety of reasons. It has been found that in very many instances such promises are not fulfilled and thus materials or parts are issued and not charged to work in process. Thus, work in process inventories on paper, are low and stores inventories correspondingly higher. This is, to say the least, decidedly misleading to management, and unless some method is devised either to prevent this, if possible, or to show up the leak quickly, much damage can be done. Also, where Purchasing Departments are supplied periodically with a list of parts to order, derived from stock records which do not agree with actual stocks, production departments can suffer holdups which play havoc with the business.

In the case of checking materials or parts issued from stores to the Production Department, extreme care should be taken not to issue such parts without the necessary requisition, and in order to offset the case of the loss of such a requisition, these should be numbered and in duplicate. Such requisitions ar ethen recorded on the stock card, sent to the stores ledger clerk and recorded in the stores ledger. Then they are costed and charged to work in process. This is as it should be, but, in order to be assured that no error has been made and that the stock cards and stores ledger sheets are a true record of the exact position, it has often been found advisable to make a periodic check between actual and book inventories. This may seem a lot of trouble and expense but, actually, it is not, especially where parts are listed by drawing number or some other such symbol. So far as weighty or very hard to handle materials are concerned, it is a difficult matter, and it will be remembered that previously it was mentioned that extreme care should be taken by the cost account to ensure an accurate record of the weight or quantity of such materials is recorded on the standard cost sheet. So far as parts are concerned, especially those easily counted either by weighing or by hand, it is very simple.

A small card can be dseigned, allowing for date, time of day, part number, description of part, stores number (to show whether semi-finished or finished where the part has the same number in either case), description of part. Quantity in stores, Quantity on stock card and stores ledger, difference (if any) cost of article per unit, total cost of difference, space for account numbers to be credited and debited, and any other information necessary to be recorded. A sufficient number of these cards should be issued by the stores ledger clerk daily, containing the part number on each card, to the stores department for the purpose of having the parts designated, in stores counted. The number to be issued should be determined so as to actually count the active inventory three times annually. The storekeeper or his assistant should actually count the parts designated, either by weighing or otherwise, just before the close of work, as at that time all issuance from stores of production parts has generally ceased for

the day, and the result recorded on the card. Any variance in the actual count from that shown on the stock card should be then recorded and the card returned to the stores ledger department in order that the count may be checked with the count in the stores ledger. If different, the stores ledger should be adjusted, the difference costed and the charge and the credit made. Also, an investigation should be immediately made in the case of any large difference. A quick observation can be made as to whether the parts are, or have been, in Work in Process, and the person responsible for the error drawn up on the carpet.

So far as a check on work in process is concerned, it has been found practical in very many instances to take an inventory of work in process at the close of work on the last working day of the month. A sheet is easily designed to show the part number, description, quantity, last operation, unit cost and total cost. This is usually completed by the foreman of each department and sent to the cost department to be costed. The total value of the work in process inventory is then compared with that listed in the controlling account and any difference of any consequence investigated. Often it is found that parts in the course of manufacture have been scrapped but not listed. These should be listed daily on a scrap report, showing the part number, description, last operation and quantity and a space left for the unit and total cost.

These fairly simple systems, if followed correctly, will result in a complete inventory control in most plants employing a standard cost system.

In the matter of the Purchasing Department, which relies mainly on the stores department for a list of parts to be ordered or those low, a monthly report by models or products, showing Part Number, Description, or name of part or material, quantity required for each unit of models or products, parts in semi-finished stores and in finished stores, in process, on order, total available, total units the parts available will produce, when completed regularly in conjunction with the previous control system, will assist the purchasing department very materially to order materials and parts in sufficient time to ensure delivery when required, and will very materially reduce production hold-ups.

The Efficiency of Cost Accounting

By WM. JOHNSTON, A.C.W.A.

(Reprinted by kind permission of "The Cost Accountant")

We are apt to consider—and it may be not unnaturally—that our own business is quite different from that of other people, quite different indeed even from those of our competitors and that the theories which have been evolved by other people for the control of their business are not quite applicable in ours. Let us ask ourselves, "is there any justification for such an attitude?"

Factories, like human beings, have their peculiarities, yet once again

like human beings, they have characteristics and traits common to all. It is here that the special knowledge and skill of the qualified Cost Accountant are so clearly and abundantly necessary. There must be formulated a scheme devised to cover the peculiarities which are our own, and to present to us their result and their effect upon the conduct and the efficiency of our business. Life and business are diverse in their character and the costing system which is applicable to one concern is not applicable to another. The manufacturing concern, from the humblest to the greatest, requires to control its material costs, its labour costs, and its overhead charges. Whether the product be mass produced, be intensively produced with a number of others within a factory making the best of an unbalanced output, or whether the product be service to the community expressed as a unit of electricity, a cubic foot of gas, or a car mile, the need is the same. That need is the calculation of the figure which is a fair and reasonable price for the commodity or service. In the retail establishment —and I believe that it is here there is yet a wide open field for initiative in the meticulous calculation of cost—one must compare department against department, and by a process of elimination, concentrate upon the selling of the most profitable product. Here is one way in which the smaller retailer can combat the ever widening activities of the multiple department chain store. He can concentrate upon and specialize in one selling line to the exclusion of others and build for himself a reputation as a specialist who understands his product and who can show to his customer its advantage and superiority. The multiple chain store must of necessity appeal to the indiscriminate—a discriminate buyer will naturally find his way to the shop which understands his need.

To come back, however, to the main issue, in the time at my disposal I cannot but deal sketchily with the main elements of costs and their control. I cannot show how the one business is different from the other, how process cost accounting is different from job costing, and how both are different from operating cost of the transport company, but I shall try to indicate how each element of cost enters into a product and how its control under varying influences is so essential if production and management efficiency is to be maintained. It is undoubtedly true to say with many other things production efficiency is due in no small measure to the detailed statements and records which are the direct result of cost accounting, and as cost accounting has been developed by improving trade conditions, so has increased production efficiency in the manufacturing concern been materially assisted by the figures which cost accounting has produced.

Materials.

Materials permeate the average business throughout. They are the basis of the product, they are consumed directly and indirectly in its manufacture, they enter into production and they enter into overhead and selling expenses. If they rise in price, every element is involved in some way according to the degree in which the materials are used. By direct materials, we mean all of the raw materials which enter directly into the finished product. If they can be collated together, the total is naturally

the raw material cost of the product. The segregation of this first cost is the initial stage in the building of our costing system. In addition to these raw materials, we have a heterogeneous collection of many materials which play their part in manufacture, yet which cannot be allocated directly as a raw material cost: such materials as oil for lubrication, oil waste for cleaning, belting, emery paper, small perishable tools, and any other items used in manufacture. They include those materials which may sometimes be used in the product, but which, owing to difficulty in accounting or calculation, cannot be charged direct to the article.

Consider, for example, how difficult it is to say the amount of material used in the chromium plating of a clock case. Whatever the circumstances it is essential that there be segregated, first the direct and, secondly, indirect materials cost: stock control is the protege of cost accounting. It has arisen from the need of calculating precisely the quantity of raw material used in the product. What are its advantages? It has resulted in savings undreamed of in the early stages of its application; dead stocks, faulty buying, deterioration, and pilfering, are all brought to light. The material is traced from the moment it enters the factory until the moment it is used in the job. Waste is no longer an unknown quantity, it is definite and calculable.

It is said that when the concern which manufactures Triplex Safety Glass was reorganized in recent years, one of the greatest factors in the successful reorganization was the elimination of waste and breakages brought to light by the control system of stocks.

Controlling stocks does much more than enable the raw material cost of a product to be calculated, it shows at any moment the total value of raw materials on hand. Consider the saving this means: it means that the purchases from day to day are recorded immediately, allocated to production and the balance expressed in terms of sterling: it means that stock-taking is eliminated, the quantity on hand of each individual material is known, is valued at its cost price, and the management knows at once the value of stocks alive and dead as they lie in the factory.

Cost accounting, working to standard does more: it sets up maximum stock levels for each individual item of stock reviewed and adjusted as market or manufacturing conditions change: not only maximum but minimum ordering levels fixed by the purchasing department and based on such considerations as time taken to replace, speed of consumption, and economical ordering quantities. It is only by detailing thus that losses through obsolescence or through overstocking can be avoided.

Consider this statement made by the general manager of a very large works: 'The customers most difficult to satisfy are those with efficient costing systems because they are not satisfied with replacements only. Their cost system apparently tells them what effect defects have on their cost of manufacture by stopping the flow of output, and by causing changing of machines already set up for some other product. They take great care to see that all parts or raw materials supplied are thoroughly inspected before issuing to their shops." The moral behind this statement is this: how difficult is it for your workmen to get raw material to replace a spoiled part

or piece of spoied materia? You may think it impossible, but unless your issuing of stores is checked by the setting up of standards of consumption for each job, they can and do obtain additional material without your knowledge.

Do you realize what spoiled material costs you? Or do you merely record the reduction in production which is resultant from it? The difference—for difference there is—is that the cost of defective work is known. If you classify it, you will probably by classification alone go a long way towards its elimination.

It is an amazing fact that the waste of materials is one of the costliest items of overhead expenditure in the average manufacturing plant. To instal a system which will control your stocks does not mean the expenditure of so much per year on the wages of a stores clerk and a storeskeeper—it means probably that in less than one year the saving which can accrue will more than compensate for the expenditure of the system. Let me say here that one must condemn the practice of employing as a storeskeeper a decrepit old man at wages little above a abourer's rate. Storekeeping is not a job for a feeble mind, it merits the activity and enthusiasm of youth with mature judgment. If your stores and stocks are not adequately controlled, then consider seriously, not the expense of a stores system, but the economy which will result from its use.

Labour.

The wages cost is perhaps the most easily calculated element of all. There are direct wages as there are direct materials; and there is the expense of indirect labour as there is the expense of indirect materials. Most manufacturers have some system which they consider adequate, of finding the direct labour cost of their product. Cost control does a great deal more than tell the labour cost of an article, it controls each hour that is worked and compares it hour for hour with the time that should be taken. Without this check, there can be no costing. Each minute that the worker is engaged upon production must be charged to a job, process, or a service, and each minute that he is idle must be charged to the item of overhead expenditure which has caused him to be idle.

I wonder how many manufacturers can tell exactly the number of minutes per day that the worker has been engaged in (1) productive labour, (2) in unproductive labour, and (3) completely idle or wasted time. The knowledge that a job has taken 24 hours means nothing until it is accompanied by the knowledge that the previous job took only 20, and that during the past three weeks the time has been steadily increasing: even that knowledge is unavailing unless it is applied and the cause of the increase ascertained.

Henry Ford is one of the greatest exponents of production efficiency through labour efficiency of high production and of high production wages, and his system of costing is meticulous. It is said of the Austin Motor Car Company that they produced a popular car to within a few coppers of the price they estimated. They pre-determined the price, built the car to its specification, and thereby proved their figures correct.

The Cost Accountant equal to his task will not only regard wages and

collate the expenditure, but will be in a position to state the method of wages payment which he considers of greatest all-round efficiency. The first premium bonus system of paying wages to be operated in Britain was operated in Glasgow almost 40 years ago, and remains to-day one of the most efficient available. Whatever is to be said for and against each system of wages payment the Cost Accountant will present to the management—whether it be day rate, piece work, premium bonus, profit sharing methods or stock distribution plans—the costing system will assist them to attain their maximum efficiency, and will (by the reports produced from time to time) show the increase in production efficiency which has resulted from their inauguration.

A live cost system will by analysis indicate the cost to each job of that insidious expense—overtime. Overtime is an expense which can be lost sight of, and it is one for which there is no commensurate return. Overhead expenses consist, we know, of production expenses, administration expenses, and selling and distribution expenses. The kernel of control is comparison of present with previous expenditure, and I hope of budgeted expenditure item for item with the actual.

Most of us are acutely aware how production expenses arise, but let us recapitulate a few of them. In production overhead charges, there is power, lighting, heating, cleaning, tools, patterns, jigs, dies, testing and designing experiments, repairs, renewals, upkeep, depreciation, wear and tear of the machines, fixtures and tools: they are all so necessary and so vital.

In administration expenses, we find interest and capital, office heating and lighting, cleaning, salaries of executives and staff, office equipment and machinery, stationery, postages, telephones, rates and taxes, insurance, legal fees, subscriptions, accident, safety and fire appliances. How many of us really know how much each of these individual items amount to in one year?

Distribution and selling expenses accrue from advertising, commission, carriage, complaints, bad debts, delivery expenses, damage in transit, and losses on unsaleable stock. In the calculation of such expenses general conditions of marketing risk and of demand become important factors. The fact, however, must always be kept in mind that even the smoke leaving the factory chimney represents an expense which must be controlled and accounted for and calculated in costs.

It is not easy to find a completely effective system of governing and accounting these items of overhead cost, but whatever the method, the clear distinction betwene the factory and selling organization must be borne in mind. All of the overhead charges of the factory must, however, difficult, be charged to the factory cost of production. The cost of packing and transit, of advertising and selling the product, must be made to stand alone. Factory efficiency in production bears no relation to selling and distribution cost, and the one must under no circumstances be made to bear part of the cost of the other.

Each trade has its own set of conditions. The problem of distribution costs in the furniture trade is not so complex or involved as that of the large-scale chocolate and confectionery trade—Fry, Cadbury, Rowntree—

think of the number of different varieties they make and of the very exhaustive marketing necessary. Cigarettes and foodstuffs are in a similar position. Only recently, Players' cigarettes featured advertisements in which they boasted of the outlandish places in which Players' cigarettes could be purchased. Heinz and his 57 varieties cover the country. The farmer's wife can find them just as useful as can mi-lady in her town flat.

This absolute segregation of factory cost is important. In these days of changing conditions, one finds firms extending and extending still again their advertising expenditure: offering more costly gifts to induce would-be purchasers: free coupons, free packets and free samples. It is well for purchaser and consumer alike to remember that one gets nothing for nothing. These inducements to purchase must be paid for, and there is such a thing as over-burdening your selling expenditure. The costing system is that impersonal factor which marks in vivid red these doubtful expenses in your profit and loss account. If production efficiency is being maintained and a standard cost adhered to with profits on the down grade, it is time to overhaul your selling expenses, but the point is this: you can do nothing until you can separate the one from the other.

Within the framework of factory expenses, there are two distinct and separate clasifications. There is the overhead cost of running the departments actively engaged in production of the product or some part of it. There is the complete cost of running the departments not engaged in production but servicing in some way the productive departments: for example, the tool room, power house and steam generation. Again, we find some expenses fixed irrespective of output—rent, insurance, depreciation of buildings, and directors' fees. We find others which vary directly with output—power, wear and tear of machinery, and indirect labour. How then are we to recover these expenses? Only a few years ago such expenses were absorbd together and it was believed that simplicity justified the practice. The gradual mechanisation of industry has made the calculation and recovery of overhead expenditure essential.

Labour is now so largely eliminated in many industries that it becomes a very small element of cost. I know of one concern in America in which the labour cost of the product is less than 3 per cent. of its total cost. The laying down of costly plant tends to make fixed expense greater than variable expense. The method of recovery which we can discuss later must never be fixed or rigid, it must be elastic enough to bring to light the necessary information to guide the policy in times of boom or depression.

Politics and Industry.

Politics and industry are now so closely bound together that the one reacts immediately upon the other. We have trade boards, tariffs, talk of rationalization, the law of the new Factories Act, the present feverish activity in heavy industries so directly a result of rearmament; we have experienced prices rocketing and falling, indeed we have now almost attained boom conditions as a result of political activity. The company with its costs of production efficiently and sensibly calculated is able immediately to take advantage of these market changes. Reviewing the past months in my own industry, which is that of the manufacture of furniture, timber advanced but neither uniformly nor consistently. Foreign politics, result-

ing in restricted outputs, accompanied by speculation at home and rising markets accentuated the position. In upholstery work, hair filling, coppered springs, and woollen moquettes all increased. Dearer coal increased the power generation costs, dearer petrol reacted at once on distribution costs; during the year, a trade dispute almost completely stopped production for three months. Certain wage increases were the direct result. Under such circumstances, a revision of selling prices was inevitable. The moral of the past year must surely be the need for detailed costing built upon completely reliable data. In my own work the question immediately arose: what lines were to be increased; what designs could b left as they were in view of intense competition? I recollect one instance which illustrates this point. Some time ago, a new product was introduced at a price carefully calculated and based upon planned production. Soon afterwards a competitive product appeared at a price much lower. The firm I have in mind were so confident their figures were correct that they wrote to their competitors suggesting they could not possibly be producing the article at the selling price they had fixed—incidentally, I wonder how many of the firms represented here would have had such courage—the reply received later showed that the selling price had been fixed on a very arbitrary basis.

Another question recently occupying the attention of many firms is whether or not existing plant should be extended. This tendency is most noticeable in times when business is greatest, but the fact remains that there is one proper time—when prices are low. Considerable prominence has been given very recently to this question in its effect upon State and Municipal expenditure. The late Keir Hardy, whom one might call "the Grandfather of Socialism" in this country, expounded this theory many years ago. It is a basic principle of management to develop to the limit the facilities available, to replan departments in order to save space. It is not in itself a bad thing to be cramped for facilities at a peak period for demand. The condition is proof that the capital investment is fully effective. Do not hesitate to invest in new machines more efficient than old, but beware of spending money needlessly. When expansion is contemplated, consider every problem involved carefully and impartially, because it does not necessarily follow that operating costs will be lowered simply by an increase in the production capacity. The Cost Accountant is the one man to translate into cold fact by his production returns and his records of idle time, both of plant and of labour, the impressions which you have, Frequently a more sympathetic and more helpful attitude towards the human element in your factory is of greater consequence and a much richer field for improvement than any mere multiplication of mechanical facilities. Labour after all is the only human thing in your factory. It is the only element in production which can engender enthusiasm and which can be led. The costliest of plant and the finest of material and equipment can be wrecked by careless labour.

The Aims of Costing.

What then are the claims of cost accounting? Primarily it calculates the true cost of production, but equally as important, it claims to increase net profits. Subsidiary to these two and as a direct consequence of them

it (1) controls stocks, (2) eliminates waste and reduces expenditure, and (3) provides other information essential for management control. The advantage from the determination of true cost of production is immediately apparent.

The Control of Stocks

The advantages from stock control may be summarized as (1) reduction of capital value tied up in stocks and raw materials, work in progress, and finished stocks; (2) speeding up production by ensuring that adequate supplies of raw materials are always at hand; (3) enabling quality and price of all materials to be established; (4) the prevention of waste by eliminating immediately from stock obsolete materials. It has been estimated that probably 75 per cent. of the factories in this country in varying degrees, continue to re-order materials if not obsolete, at least almost so; and (5) the prevention of theft and the prevention of deterioration. Experience has recognized the truth of these claims. I sometimes wonder what form of stock control is applied at the Mint!

Elimination of Waste.

Regarding the elimination of waste, the incident in the Triplex Glass factory to which I have already referred is a striking example of the data which can be furnished. It is the comparison of statistics which bring to light almost all of the hidden leakages. Indeed the job of all statistical information should be: (1) to reduce expenses, (2) to increase production, and (3) to increase sales. If the statistics produced do not achieve these purposes, it is most probable that the computation of the statistics is itself an unprofitable expense. There is no advantage in examining figures which have no practical relation to these three chief ends.

Methods.

Cost accounting make these claims. Let us consider now, the methods by which it achieves them.

Three main essential needs are apparent: (1) a definite plan of production; (2) the translation by the Cost Accountant of the plan into detail items of cost; and (3) the analysis of costs to induce comparison, detail by detail, of past and present results and to differentiate decisively between fixed and variable expenditure. One of the most striking features of the development of trade is the increase in responsibility for marketing which has fallen to manufacturers. In my own furniture trade, as in many others, the retail distributors have gradually reduced the range and quantity of stocks which they carry, thereby passing the burden of both anticipating and meeting demand to the manufacturing side of the industry. Whatever the merits or demerits of the practice, it has increased the responsibility of the manufacturer. Larger and more comprehensive finished stocks are necessary in order to effect the speedy delivery now necessary to the distribution.

Under such conditions, some form of budgetary control is almost essential. A definite programme of production and a planned output could be used as a standard measure of cost against which can be compared the results of subsequent periods. Judgment, whether it be in industry or in art, is impossible in the absence of a standard whereby to judge.

Standard Cost.

The desirable standard is an estimated cost for each product, against which each deviation in production will be calculated and controlled. Coupled with that cost, it is desirable to have a periodic forecast of the profit earned during intermediary periods between the presentation of the annual financial accounts.

The setting up of these standard costs entails a considerable amount of detail work on the part of the Cost Accountant, entails a considerable amount of probing into facts and information which have been guarded perhaps by the works executives as within their own domain. Wholehearted co-operation between those in charge of production and the Cost Accountant is vital.

I never cease to be impressed with the gradual changing over from distrust to enthusiasm which overcomes the average departmental foreman when he finds the Cost Accountant can help in maintaining production efficiency in his department, and I have always made it my practice to encourage these men to seek all the information they desire from the cost office.

Material Costs.

Material costs entail standard buying prices for all materials. The budget is prepared by the buying department—perhaps a solitary buyer—and once agreed, the buyer accepts all responsibility for buying at the estimated prices. Purchasing has one function—to locate the most suitable sources of supply and to purchase at the most economical price—but ask yourself, "does your purchasing department fulfill this function?"

Do you measure its efficiency? are you sure, for example, you have not priced an article on the basis of an extraordinarily favourable purchase? Ask your buying department to fix a standard price and to purchase at it, or better. Next there arises the question of standard consumption of materials to each job and it rests with the Works executive to make certain that waste of materials of all products comes within the limit set. With standard material prices and pre-determined waste, the calculation of a standard materials cost is simple. Let me illustrate again from my own industry. Timber is allowed to season for a considerable time before it is used in production. It is relatively simple to estimate when each lot of timber will enter production. The actual cost of the timber when purchased almost determines the standard price at which it is to be calculated in cost. The onus regarding consumption and waste is, however, upon the shoulders of the production executive who carefully examines each consignment of timber and estimates the yield from it. Since one class of timber is generally purchased for a specific class of work, it is possible to estimate very closely the yield from each purchase of timber. The comparison of actual with the estimated standard obviously becomes a sound measure of check and control.

Labour Costs.

The calculation of standard labour costs is essentially a matter for the Works executives, but in many cases, the final figures are prepared only with the aid of past records compiled by the Cost Accountant. Where the

labour problem is complex, as in an engineering works, a rate-fixing department will probably deal with all questions of labour cost and furnish to the Cost Accountant the necessary standard figures for each product in production. In such a case, the Cost Accountant will merely measure actual against standard cost, and thereafter leave the matter to the Works manager.

Factory Overhead Charges.

The recovery of factory overhead expenses is decisively determined by the budgeted determined program. In estimating the production load for the ensuing period, the question of idle time requires to be carefully provided for. For example, it may be decided to proceed with the budget on the basis of the factory attaining, during the period, a production of 70 per cent. of actual capacity. If, during the period, production is maintained at, say, only 60 per cent. capacity, the unabsorbed portion of factory overhead charges is carried to profit and loss account as the cost of idle time. In this way the directors know at once the loss involved through the lack of work obtained, and can take the necessary steps to review the position. They may eventually decide to reduce the rate of production set by the budget, but no matter what the ultimate decision, they will be in a position to realize by how much such a step will increase the unit cost of production, per product. The lower the rate of output, the greater is the proportion of fixed factory expenses which each unit of output must bear.

Selling Expenses.

The intensity of modern competition has resulted in the somewhat malicious practice of arbitrary or opportune price fixing, dependant upon the state of the market. With a price fixed in such a way, the necessity

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for knowing precisely the actual margin left for profit is self-evident. The incidence of cost is not at once apparent, but is felt in the long run. Wherever possible, advertising expenses are budgeted in detail and allocated to the product or groups of products necessitating the expense. These expenses when collated together are charged as a percentage of total cost and the proper selling price arrived at.

It is thus possible to determine which lines are the most profitable and which should be discarded or again re-examined with a view to further economy in production. Nothing can justify the selling of an article at less than its due price, and the chief aim of costing—as indeed of all forms of production improvement—is to improve the product and to increase the net profit.

The Period.

For the period which is to be taken as standard production, the cycle varies in each industry. In my own trade, we have each year a complete revision of design. A similar example is that of the wireless industry. Most of us are familiar with the very clever Murphy Radio advertisements based on this self-same point. One important aspect of the budget system of costing is the ease with which standards can be adjusted to meet changes in market conditions. Complete segregation of each element of cost localizes at once the point at which the change in condition affects the total cost, and the necessary adjustments can be made. An increase of 1d. per cubic foot in the cost of oak can be applied immediately to each design in an entire range of suites.

COMPARISON OF ACTUAL WITH STANDARD

Materials.

The complete comparison of actual with budgeted expense is obtained each month when monthly accounts are prepared, but when material consumption is concerned, the comparison takes place continuously day by day. In the consumption of materials only that permitted by the master schedule relating to the work undertaken is issued from the stores. Any excess issue is immediately apparent when a materials requisition in excess of that allowed on the master's schedule is presented to the stores or when the required number of finished parts is not forthcoming from the material issued. In practice, such requisitions are made on a specially coloured form so that attention to them is drawn at once. In the consumption of materials, the comparison between standard and actual must be available at a time when it is possible to ascertain the cause. This question of the investigation of leakage, if it is to be successful, must present discrepancies while the information is yet news, not history. Let a week elapse and a foreman can excuse anything.

An important statement prepared under the budget control is that named "profit and loss on buying prices" statement. If anything can keep a buying department efficient it is this form. The stores records show receipt and consumption at both standard and actual prices. The difference is transferred each month to an account which summarizes all the variations from standard and eventually presents at the end of each month a figure

which is the profit or loss in total on the actual materials cost over the estimated cost.

Labour.

In the field of labour, the difference between the actual wages paid and the amount recovered on production calculated at standard rates is compared and detailed under contributory headings: the cost of idle time, the cost of breakdowns, and the cost of training labour, could be readily ascertained. Idle time is incidental to manufacture, it forms an item of overhead expenditure to the departments immediately concerned. There is included the cost of time lost due to breakdown of machinery, waiting for tools or for material, waiting perhaps for machines. What more effective check can there be on the efficiency of the foremen or production engineers than the classification of this idle time into these contributory classes? I think it is safe to say that in the average concern, the majority of inefficiencies exist because the executive most concerned with their elimination does not know of them in time. The man with power to examine each as it arises is possibly not available when it occurs and so it is lost sight of. Cost accounting, through its constant enthusiasm, places such discrepancies or faults before the responsible executive. It enables him to know of these faults which, though small in their isolation, become surprisingly costly in their total.

Another existing comparison is possible at this stage. We all know that increasing prices of raw materials react at once on labour costs. In a time of rising prices in materials of all classes, the management at once turn to labour and endeavour to obtain something more in the way of production to compensate for the higher prices. The statement of labour cost variations actual with standard shows the result of this increased pressure upon labour.

Before leaving the point, may I say the figures must be interpreted with judgment. Labour costs must inevitably vary. Human productivity is not mechanical and we never can expect it to be, but we should know, as executives, of variations and their causes. Labour costs cannot be expected to be constantly reduced if there is no change in equipment or production methods. Misguided labour critics have referred to cost systems as something inhuman. We, as representative of the best in management, cannot afford to give room for such criticism.

Overhead Charges.

In the departmental comparison of actual expenditure incurred and charged to the department, against the standard overhead value of production attained, two main factors determine differences: (1) over or under absorption of expense consequent upon increased or decreased production; (2) over or under spending against the actual budget amount. A time of rising prices and materials for supplies would naturally affect the expenditure for indirect materials. The comparison of the two shows clearly the effect of these increases or decreases. Differences due to change in production load are carefully classified between fixed and variable expenditure and it is possible to calculate the precise effect upon the recovery of both fixed and variable expenditure which an increase or decrease in production

will have. This knowledge is most effective when the management is considering the introduction of new products, or the more intensive manufacture of the old.

SELLING AND ADMINISTRATION EXPENSES

Selling and distribution expenses provide a field of speculation of their own. Indeed, it is only now that cost accounting is beginning to apply to this problem the meticulous attention it has given previously to factory expenses. The costs of distribution and selling are no less important than manufacturing costs. Take, for example, the cost of selling a product in one district as compared with another. The difference between the two can provide a perplexing problem. In the manufacture of sweets, manufacturers have to take into consideration the fact that some assortments may be popular in one part of the country and unpopular in another. Each individual classified expense must be compared district for district, actual against standard. It is thus possible to show the absorption of selling expenditure in each trading territory and to ascertain thereby the most economical. As an elaboration of this, it is possible to apply the comparison between different selling representatives. Over or under absorbed expenditure can only be carried to profit and loss account as a profit or loss.

Methods.

The actual mechanical methods of recording in the cost accounts such comparisons and calculations, I do not consider rightly within the scope of this talk: suffice it to say that modern practice co-ordinates cost and financial accounts into one complete accounting scheme. Within the general ledger, an account is opened to which is debited in classified totals only the actual expenditure incurred on behalf of the works, and the corresponding credit is the general ledger control account in the factory ledger. The actual expenditure which is credited in total to the control account in the factory ledger is also debited to the various factory ledger accounts in detail until the comparison of gains and losses of production against standard are obtained.

If this Exhibition has succeeded in its purpose, it will have convinced you of the almost infinite capacity of mechanical accounting. I have yet to learn of the work so complex that it was beyond mechanical control. Under present conditions, where every market is in a constant state of flux, it is impossible to stabilize either costs or prices, and management must equip itself to deal adequately and promptly with the repercussions of each movement in the market. However crudely it may be, we all forecast our market and produce in anticipation of demand. It is surely logic then that we should forecast as intelligently as is within our powers of reasoning.

Enthusiasm for a common ideal is an inherent quality of man, and surely from a sales budget we can so unify our efforts that the budget is our central objective, setting down a standard of attainment for all, and co-ordinating and co-operating until it is attained.

There is:—

A standard of investment in stock;

A standard of work in progress;

A standard of expenditure in factory expenses;
A standard in selling and administrative departments; and lastly
A standard of capital investment.

CONCLUSION

A costing system cannot in itself provide management with the complete answer to its problems. Facts and comparisons, however, are a solid basis for the enlightened discussion of such considerations of policy as occur from day to day:—

The alteration of prices;
The elimination of unprofitable lines;
The concentration upon profitable lines;
The reduction of expenses;
The selection of alternative processes on materials;
The extension of plant; or
The question of capital investment.

A completely efficient costing system controlled by a qualified Cost Accountant conversant with the technicalities of manufacture gives to management what it needs—sound, straightforward efficiency. System is necessary, method is important, discipline is inevitable, but greater still there is the quality of adaptability in the man who calculates costs.

This Exhibition vouchsafes the enthusiasm of management, but unless the directors and managers are willing to make their decisions only upon the positive facts laid bare by complete cost acounting and not upon conjectures and vague impressions carried in their own minds, they will fail to attain what they strive for—what we all strive for—efficiency.

New Members

Montreal Chapter.

H. K. Ingersoll, Crain Printers Ltd., Ottawa.
J. C. Bouskill, Miner Rubber Co. Ltd., Granby, Que.
H. J. Chalmers, The Steel Company of Canada, Ltd.

Toronto.

H. G. Crockford.
H. R. H. Smith, Moffat's Ltd., Weston, Ont.

Hamilton Chapter.

C. Goodenough, The Hoover Co., Ltd.
R. S. Watson, C.A., Peat, Marwick, Mitchell & Co.
P. B. Pratt, Remington Rand Ltd.
A. S. McPhail, G. W. Hendershott Corrugated Paper Co., Hamilton.

Niagara Chapter.

J. E. Thorpe, Electro-Metalurgical Co. of Canada Ltd., Welland.
L. B. Oille, W. S. Tyler, Co., Ltd., St. Catharines.

London.

J. G. Storey, Underwood-Elliott-Fisher Co., Ltd.

New Thousand Island International Bridge Completed

The new Thousand Islands International Bridge joining the United States and Canada across the Thousand Islands and St. Lawrence river is now completed and had its official opening on August 18th of this year.

The project, whose terminals are Collins Landing, N. Y., near Alexandria Bay, and Ivy Lea, Ont., near Brockville, is composed of five separate bridges and eight and one-half miles of approaches and connecting roadways. Robinson and Steinman (New York City), the designing engineers, have utilized the islands and other natural topography to reduce the length of spans, reducing the total cost of construction to $2,200,000.

Begun on May 1st, 1937, construction of the bridge system was contracted for completion November 1st, 1938. Well ahead of schedule, the entire crossing was opened for traffic on August 18th.

Prime Minister Mackenzie King represented Canada, and President Roosevelt the United States at dedication ceremonies on August 18th, which celebrated the century of peace and good will between the two nations since last border troubles in the patriot wars of 1838.

Engineers who surveyed the terrain of the region for the path of the bridge crossing later discovered that they had chosen a course almost identical with that of an older trail—the one immortalized by James Fenimore Cooper in his "Last of the Mohicans" and "Deer-slayer" as the old Mohawk Trail. Ironically, over 75% of the bridge workers on the project are Indians descendant from tribes on either side of the St. Lawrence river which once were members of the great Mohawk nation.

In its northeasterly passage over the St. Lawrence, the bridge system's crossings are, in order: the American Channel suspension bridge, from Collins Landing to Wellesley Island, with 800-foot main span and 150-foot under-clearance above the river; the International Rift Bridge over the boundary between Wellesley (U. S.) and Hill (Canada) Island, a 90-foot rigid frame arched span of reinforced concrete with masonry facing; a continuous truss of two 300-foor spans, from Hill to Constance Islands; a steel arch of 348-foot span from Constance to Georgina Islands, and the Canadian Channel suspension bridge, with 750-foot main span and 120-foot under-clearance, from Georgina Island to the Ontario mainland.

Most symbolic member of this newest link for friendly international intercourse is the small International Rift Bridge—well nicknamed "The Biggest Little Bridge in the World." Bronze tablets mounted on the railings and a brass strip across the roadway denote the exact position of the U. S.-Canadian boundary. Faced with granite cut from native rock on the site, the arching span virtually unites the two great nations with (their soil), (a tie fashioned of their own bedrock).

Design and Architecture.

Considerations involving design and architecture afford interesting object lessons in bridge engineering. Natural topography, particularly the

exposed rock or island formations, dictated choices of bridge types for the various crossings. With the steel arch span, for example, natural rock abutments rising sharply from water level were a decisive factor, as was a small rock island in mid-channel for the two-span continuous truss. With the Canadian Channel suspension bridge, an uncharted rock shoal 240 feet off Georgina Island cut costs sharply and was the key to placement of spans, piers and anchorages.

Since the Thousand Islands area is particularly scenic, both architecture and design were conceived for effects in harmony with the attractive setting. The suspension spans, with their straight tower lines, arched portals and graceful cable and roadway deck curves, provide the dominant features. For purposes of color harmony, the steelwork will be painted a patina green.

To afford motorists unobstructed views of the island panorama, engineers made primary decision for the use of deck structures to minimize the presence of truss members and bracing; in addition, the high underclearance requirements for the channel crossings made unfeasible the use of deck truss bridges. These conditions, together with the presence of rock at or nar ground surface for use as inexpensive anchorages, led to the adoption of the suspension type for the principal spans—for which it held a clear economic superiority. Shallow plate girders only six feet deep are used for stiffening.

For similar reasnos, deck girder spans are used for the approaches, with viaducts constructed as a series of three-span continuous girders to provide maximum rigidity and economy.

As part of the Canadian crossing, the 348-foot steel arch span, directly south of the Canadian Channel suspension bridge, has a roadway elevation sufficiently high to permit use of a deck structure. Natural rock abutments and the beauty of the site eliminated choice of a simple truss span, considered first, in favor of the graceful steel arch and its pleasant contrast to the adjacent suspension bridge.

The continuous through truss of two 300-foot spans, between Constance and Hill Islands and linked to the suspension and steel arch spans by the length of plate girder viaduct over Constance Island, was selected over a deck structure because of the low level of the roadway, the width of the channel and the presence in mid-channel of a small rock island for the centre pier.

Main and Viaduct Piers.

Favorable topographical conditions throughout the crossing served to reduce cost of substructure to a minimum. All but one of the main piers are founded on exposed or shallow bedrock; the exception is the south main pier of the Canadian Channel suspension span, founded on a shoal of solid rock surrounded by deep water. Discovered during preliminary surveys, the shoal affords a pier foundation only 17 feet deep, 240 feet offshore. This made possible a much shorter and less expensive main span than would normally have been required, as well as a cable anchorage within the narrow limits of Georgina Island. Wind on the tower and traveler during tower erection governed design of the shallow piers.

The advantageous nature of the natural conditions is best illustrated by the fact that the cost ratio of substructure to superstructure on this project is only 1:5. The normal economical plan predicates equal costs.

The viaduct is composed of sets of three-span continuous girders. Every third pier is of high concrete construction to provide room for expansion rockers and take the longitudinal reaction, and the intermediate piers are flexible steel columns.

Other viaduct piers are founded on rock or earth. With the former, anchor bolts running through the pier and five feet into the rock take up the temporary uplift reactions from wind action on the structure without its concrete deck; the completed structure will have no uplift reactions. Piers founded on earth have been designed for maximum base pressure under one and a half tons per square foot.

Anchorages.

As with the piers, fortunate natural conditions made possible several unique anchorage treatments. The south anchorage of the Canadian Channel suspension bridge, which lands on the north side of Georgina Island but is anchored on the south shore because of the island's narrow width, provides an example. The sharply rising rock formation on Georgina's south shore was found to be ideal for resistance both to the horizontal thrust of the arch and to horizontal cable pull. Taking full advantage of the fortuitous situation, engineers located a triple-function pier at this point: the pier serves as the south anchorage of the suspension bridge, as the north abutment of the steel arch and as the pylon flanking the north end of the arch to support the connecting viaduct span and the arch floor panel. Accordingly, a ratio of 1:1 instead of the normal 2 or 3:1 exists between net vertical weight and maximum horizontal reaction from arch and cables combined.

The American Channel suspension bridge's south anchorage is on the mainland, where rock was located 30 to 50 feet below the surface. After excavation to a depth of 15 feet, steel piles made of 14-inch, 89-pound H-beams were driven over the area of the base; 64 piles were vertical and 68 were battered 5:12 to resist cable pull. A high concrete pier supporting viaduct spans is carried to the rear end of this anchorage, which has a net vertical weight approximately 2:2 times the maximum horizontal component of cable pull and a ratio of about 3 for the cables' dead load pull.

Solid rock close to the ground surface holds the north anchorages of both suspension bridges, reducing cost and size to a minimum.

New Cable Anchorage Introduced.

A newly developed type of anchorage for multiple rope-strand cables, considered the simplest and most economical form yet devised, and invented by Dr. Holton D. Robinson of Robinson & Steinman, has its original application on the project's two suspension bridges. Engineers report that the new anchorage arrangement, working smoothly and easily, has proved itself quite satisfactory.

In this new anchorage form, each of the 37 $1\frac{1}{4}$-inch strands composing the suspension span cables, which are of pre-stressed rope-strand construction, is separately and adjustably connected to a projecting end of one of 37 round steel bars, $2\frac{5}{8}$-inch in diameter and independently im-

bedded in the anchorage concrete. Set in hexagonal configuration to match the strand arrangement, the bars converge as they project from the anchorage to meet the diverging strands. Each strand terminates in a cast steel socket which is externally threaded, opposite hand, and the upper end of each bar is upset and threaded. An internally threaded sleeve, turned by a wrench, serves for connection and adjustment between the anchor bar and strand socket. Following adjustment for length variations to assure uniform strand tension, the ends of the connecting sleeves are spot-welded to preclude subsequent rotation.

Floor System.

The bridge system carries two-lane roadway, 22 feet wide, and two sidewalks. On the suspension spans, stiffening girders contain the roadway and sidewalks; serving as railings, these are low enough to permit motorists a clear view of the surrounding panorama. The armored concrete roadway, 4¼-inch I-Beam-Lok, employs the usual layout of floorbeams and stringers.

Floorbeams on the viaduct spans are spaced about 6½ feet, decked on and cantilevered beyond the girders, with the roadway made of the conventional 8-inch reinforced concrete slab. The floorbeam arrangement proved economical in steel and facilitated erection, apart from being convenient for simple and solid connection of railing posts.

Organization and Construction.

Construction of the new bridge system was under the auspices of the Thousand Islands Bridge Authority, Waterdown, N. Y. Established by Act of Legislature of New York State, its members are Elton H. Miller, chairman; Frank J. Martin, vice-chairman; Leon Schwerzmann, secretary; Eben C. Sawyer and Ross Parker, all of Jefferson County, N. Y. W. Grant Mitchell is executive secretary.

The Canadian franchise of a private corporation, formed previously in Canada to build the Canadian crossing, was transferred to the Authority. Financed by revenue bonds to be repaid from tolls, the bridge will become a free public crossing when the bonds are amortized.

Robinson & Steinman, engaged as Consulting Engineers in charge of design and construction, designed the entire project. J. London was in charge of the office force on design and R. Boblow of the resident corps on construction. Monsarrat and Pratley, of Montreal, were retained as associate engineers and Wm. T. Field, of Waterdown, was advisory engineer.

Contractors for the five principal contracts into which the project is divided were the Dominion Construction Co., for the American substructure; American Bridge Company, for the American superstructure; Cameron and Phin, for the Canadian substructure; Canadian Bridge Company, for the Canadian superstructure, and R. A. Blyth, for the International Rift span.

Seventh International Management Congress

TENTATIVE PROGRAM of GENERAL AND TECHNICAL SESSIONS

In view of the world wide complexities confronting management today, those responsible for the program of the Seventh International Management Congress decided that such an international gathering can render its greatest service by devoting itself not only to the advancement of management practice, but also to the promotion of a better understanding of the economic and social forces affecting business enterprise in present-day society. Accordingly, the program, presented here in preliminary outline, includes both General and Technical Sessions.

At the General Sessions, addresses will be given in pairs to introduce the American and foreign points of view on social and economic aspects of management. It is expected that these addresses will help to clarify the broader responsibilities of management and provide a basis for judging current management practices as described in the papers to be discussed at the Technical Sessions.

The six series of simultaneous Technical Sessions will provide for a discussion of recent developments in management techniques, pertaining separately to administration, production, distribution, personnel, agriculture and the home. No papers will be presented orally. All papers are to be preprinted with provocative critiques and supplied to registrants. Thus the full time of the Technical Sessions in Washington can be devoted to discussion. All these Technical Sessions will culminate in a final assembly where the chief rapporteurs will summarize the discussion in the respective sessions.

Monday, September 19th, 1938.

11.00 a.m.—Opening session.

Convening of the Congress by Viscount Leverhulme, President of the International Committee of Scientific Management.

Address of welcome by a representative of the United States.

2.30 p.m.—General Session.

Address: Management's Responsibilities to Society (speaker to be announced).

Development of the Management Movement: A Review and an Interpretation—Harry Arthur Hopf, Deputy President, International Committee of Scientific Management.

Tuesday, September 20th, 1938.

9.30 a.m.—Simultaneous Technical Sessions.

Administration—Administrative and Financial Controls.

Production—Manufacturing Management (general applications, coordination of functions, decentralization of industry, research and development, purchasing and insurance).

Distribution—Market Analysis and Sales Planning.

Personnel—Industrial Relations, Personnel Function and Collective Co-

Agriculture—Land and Soil Resources.

operation.

Home Management—The Home Management Problem.

(Adjournment at 12.00 m.)

12.30 p.m.—General Session (luncheon).

Address: Influence of Technological Progress upon Social Development—Dr. Karl T. Compton, President, Massachusetts Institute of Technology, Cambridge, Massachusetts.

Address: The Social Aspects of Rationalization (speaker from Germany to be announced).

2.30 p.m.—Simultaneous Technical Sessions.

Administration—Organization.

Production—Plant Layout, Processing and Equipment.

Distribution—Market Outlets and Trade Channels.

Personnel—Wage Administration and Incentives.

Agriculture—Crops and Forests: Their Production, Protection and Use.

Home Management—Material Resourcse—the Management of Time, Energy, Money in the Home.

(Adjournment at 5.00 p.m.)

8.30 p.m.—General Session.

Address: Reshaping Distribution to Modern Economy—Oswald W. Knauth, President, Associated Dry Goods Corporation, New York, N.Y.

Address: Co-ordination of Production and Distribution (speaker from Sweden to be announced).

Address: The Balancing of Incentive and Security—Ralph E. Flanders, President, Jones and Lamson Machine Company, Springfield, Vt.

Address: Employee Security as a Responsibility of the State (speaker from Italy to be announced).

Wednesday, September 21st, 1938.

9.30 a.m.—Simultaneous Technical Sessions.

Administration—Executive Personnel Administration.

Production—Production, Material, and Quality Controls.

Distribution—Costing and Pricing.

Personnel—Training, Vocational Guidance, and Applied Psychology.

Agriculture—Farm Animals: Their Breeding, Nutrition and Use.

Home Management—Household Employment and Community Resources.

(Adjournment at 12.00 m.)

12.30 p.m.—General Session (luncheon).

Address: Psychological Foundations of Management—Dr. Henry C. Link, Secretary-Treasurer, Psychological Corporation, New York, N.Y.

Address: Human Aspects of Management (speaker from France to be announced).

2.30 p.m.—Simultaneous Technical Sessions.

Administration—Public Administration.

Production—Work Simplification (time and motion study).

Distribution—Advertising and Sales Promotion.

Personnel—Accident Prevention, Safety and Health.

Agriculture—Labour Resources and Their Use on the Land.

Home Management—Housing for Living.

(Adjourned at 5.00 p.m.)

Thursday, September 22nd, 1938.

9.30 a.m.—Simultaneous Technical Sessions.

Administration—Office Management.

Production—Cost Methods and Accounting for Control.

Distribution—Administration of Sales (including salesmen's training).

Personnel—Unemployment and Social Security.

Agriculture—Economic and Social Factors in Agriculture.

Home Management—Panel Discussion.

General Management—National and Economic Significance of Scientific Management.

(Adjournment at 12.00 m.)

12.30 p.m.—General Session (luncheon).

Addresses: The Continuance of Free Enterprise (speakers from United States and Czechoslovakia to be announced).

2.30 p.m.—General Session—Topic: A Common Ground for Labor and Management.

Addresses:

Labor's Aims and Responsibilities—Robert J. Watt, American Workers Delegate to International Labor Office, Washington, D.C.

Management's Aims and Responsibilities—Lewis H. Brown, President, Johns-Manville Corporation, New York, N.Y.

The Public's Concern in Industrial Harmony—William Allen White, Editor, Emporia Daily and Weekly Gazette, Emporia, Kansas.

The Machinery of Industrial Conciliation and Arbitration (speaker from England to be announced).

7.00 p.m.—Banquet.

Address: The Unwritten Charter of Management (speaker to be announced).

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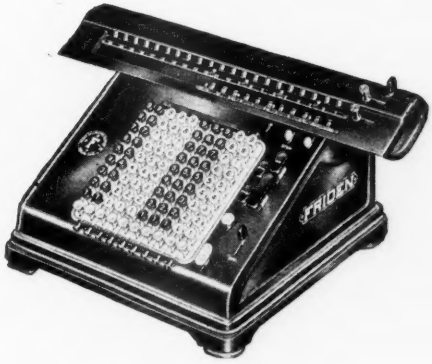

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PAST PRESIDENT

L. A. Peto, Canadian Car & Foundry Co., Ltd., Montreal, who is a Past President of the Society, and who still retains an active interest in its affairs.

Address: International Co-operation in Management (speaker from Holland to be announced).

Friday, September 23rd, 1938.

9.30 a.m.—Summary Session.

Presentation by Chief Rapporteurs of summaries of the individual Technical Sessions.

2.30 p.m.—General Session.

Address: Social and Economic Aspects of Management (speaker to be announced).

Closing address by the Honorable Daniel Roper, Secretary of Commerce of the United States.